



Botanical Inventory of Pinnacles National Monument's New Lands

A Volunteer Botany Inventory

Natural Resource Report NPS/PWR/SFAN/NRTR—2008/083



ON THE COVER

Volunteers prepare to grid part of the new lands at Pinnacles, flagging any unknown plants
Photograph by: Elizabeth Speith, Golden Gate National Parks Conservancy

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Introduction

In 2000, the National Park Service (NPS) created 32 networks of NPS units across the United States that were formed and funded to “improve the ability of the NPS to provide state-of-the-art management, protection, and interpretation of and research on the resources on the NPS ... and to assure the full and proper utilization of the results of scientific studies for park management decisions” (National Parks Omnibus Management Act of 1998). The San Francisco Bay Area Network (SFAN) is one of eight of these networks in the Pacific West Region of the NPS. The SFAN is composed of seven park units and includes Point Reyes National Seashore, Pinnacles National Monument, John Muir National Historic Site, Eugene O’Neill National Historic Site, and Golden Gate National Recreation Area including Muir Woods National Monument and Fort Point National Historic Site. The network fosters collaboration and creates efficiencies of scale in designing and implementing a natural-resource-focused Inventory and Monitoring (I&M) program. While SFAN is in the monitoring phase—meaning primary inventories have been completed—I&M staff offer technical assistance to parks where possible.

Pinnacles National Monument (PINN), located in the Gabilan Mountains of the central Coast Range of California, was originally established in 1908 to preserve its unique geologic features. Chaparral, oak and gray pine woodlands are the predominant plant communities; over the past several years vegetation crews have surveyed much of the monument in support of the I&M-, PINN-, and USGS-NPS-funded vegetation map and added nearly 30 species to the park plant list (per Sharon Franklet, 2007); additional species have been added by park staff, and through an herbarium audit at the park. Within that time period, however, new lands have been added to PINN. These areas include former ranch parcels, the campground, and Bureau of Land Management lands on the north and east sides of the monument. The new lands are not included in the vegetation map, and little is known about them. To increase knowledge of the plant species on these lands, support the wetland inventory effort, and provide information to support park management of the yellow starthistle (*Centaurea solstitialis*)-infested ranch lands, Inventory & Monitoring staff led a volunteer-based botany inventory in April 2007.

Methods

Site Selection

PINN botanist Sharon Franklet identified five general areas of the park in need of inventory attention. During a planning visit March 12-13 2007, I&M Biologist Andrea Williams visited several of these sites with Sharon to determine appropriate methods, approximate effort needed, and clarify objectives for the inventory. Two main foci were wetland areas and sites slated for management that year (see maps). Two wetlands (“Seep 1” and “Seep 2”) in McCabe Canyon, the sedge beds and deergrass meadow further upcanyon, the yellow starthistle bottomlands, the campground, and the entrance meadow had inventory methods planned. Estimated time to complete, priority for monitoring, and number of persons available on each day determined the final sequence. Because surveys in McCabe Canyon took longer than anticipated, and because surveying in a full campground on a Sunday would have been difficult, a second day was spent gathering information in the canyon and the campground was not inventoried.

Inventory Methods

Compiling a plant list—knowing what plants were present—was a common objective for all areas. Sampling often “misses” species at very low cover (*e.g.*, Goslee 2006) which may be picked up on full area searches; these site-rare species were of particular interest in areas impacted by invasive species, as park managers wanted to target management for sites with higher remnant biodiversity. Full area searches are time-consuming, but by using many eyes it can be accomplished quickly. PINN botanist Sharon Franklet recruited dozens of volunteers for the weekend effort to assist with these area searches.

Measures of Abundance

In the entrance meadow and bottomlands, nested frequency quadrats were used for baseline data collection: their ability to capture many lifeforms in many stages make them less subject to phenology shifts that would be seen in cover estimations over a growing season, and the nested design buffers against the plot-size dependency of frequency by measuring in several sizes at the same sampling with little additional effort. Quadrat sizes were 0.01m² (10cm x 10cm), 0.0625m² (25cm x 25cm), 0.25m² (50cm x 50cm), and 1m²; the smallest size was added due to the high frequency of certain species (primarily *Centaurea* and *Bromus* species) seen in pilot sampling. Plots were read by searching the smallest quadrat first, and calling out “one” for each live, rooted species in the 10cm x 10cm quadrat. The 25cm x 25cm was searched, and any new species seen there was given a “two,” and so on for three and four. One then had a list of all live species for that square meter, because any species that was in a smaller quadrat was also within the larger.

Transects were laid across perceived gradients, systematically with a random start. Transects were 70-90m long in the entrance meadow, and 30-50m in the “airstrip” portion of the bottomlands. Plots were 10m apart in transects longer than 40m, 5m apart if the transect length was less than 40m. Both distances should be great enough to allow for analyzing plots as the sample unit, not transects. In the entrance meadow, the first plot was placed at a random start point along the transect from 0-9.9m. In the airstrip, the first plot was placed at a random start point along the transect from 0-4.9m. All random numbers used in sampling were chosen from

page 341 in “Measuring & Monitoring Plant Populations” (Appendix 6, Table of Random Numbers; Elzinga et al. 1998) by blind pen-stab at a copy of the page, then taking the nearest two digits on the line under and to the right of the pen.

Training

Each day included morning meet-up at the campground store for round-robin introductions and safety training. Each person was asked to introduce herself, say why she was there, and name a safety hazard that might be encountered that day; the next person would introduce herself, say why she was there, and name the mitigation or response to that safety hazard. By having volunteers bring up and “solve” safety issues, they were made aware of potential dangers and how to avoid them, and also felt more invested in their own safety than if lectured. Topics covered included sun- and heat-related dangers; rattlesnakes; poison-oak and other potentially dangerous plants; footing/slips, trips, and falls; spiders and other potentially dangerous invertebrates; and barbed-wire. After the round-robin, Andrea and/or Sharon went over the plan for the day: site, objectives, and general logistics.

Once on-site, volunteers were trained to recognize the most common plant species. For the entrance meadow and yellow starthistle bottomlands, these included *Centaurea solstitialis*, *C. melitensis*, *Erodium botrys*, *E. brachycarpum*, *E. cicutarium*, *Bromus hordeaceus*, *B. diandrus*, *B. madritensis* var. *rubens*, *Avena fatua*, *Vulpia* sp., *Eriogonum californicum*, *Plagiobothrys nothofulvus*, *Hirschfeldia incana*, and *Rumex crispus*. The bottomlands training also included *Hordeum* species. Volunteers were given pin flags (wire flags) and lined up at a starting point for their grid, and asked to walk slowly through the area, looking for and flagging any plants that were not the species they had been shown. The grid lines were made perpendicular to any transect lines. Methods for McCabe Canyon are covered below.

Entrance Meadow—April 5

There were two major purposes for this survey: compile a species list for the meadow, and get pre-burn baseline information. Nested frequency quadrats were placed every 10m along a transect across the meadow (perpendicular to the fenceline on the west side, and perpendicular to the tree/shrubline that runs parallel to the northeast portion of the fenceline on the east side). Transects were placed systematically every 100m with a random start (random number from same table) from the junction with the northern fenceline. The west side transects started 51m south along the western fence from the junction, the east side started 64m south of the junction. Three transects were placed along the west side and two along the east, due to the shape of the meadow. Andrea Williams read all nested frequency plots; Justin Holgerson was her recorder.

While nested frequency plots were being read, the remaining six persons (Elizabeth Speith, Esperanza Hernandez, Janet Cicero, Goniela Iskali, Andrew Clapp, and Edie Nelson) spaced evenly along the northern fence and walked south, flagging unknown species. The search area approximated the “proposed burn area” delineated by the park, but extends slightly south to the small cluster of oaks and break in slope; it stops at the drainage. Andrea then went through the meadow and checked each flag, recording any species not captured by the transects. Photos were taken of unknowns not positively identified, as well as photos of plots. Elizabeth mapped the

wetland boundary within the meadow using a Garmin iQue, delineating a “core” wet area and outer edge of indicator species (generally *Juncus balticus*).

Pinnacles NM Entrance Meadow

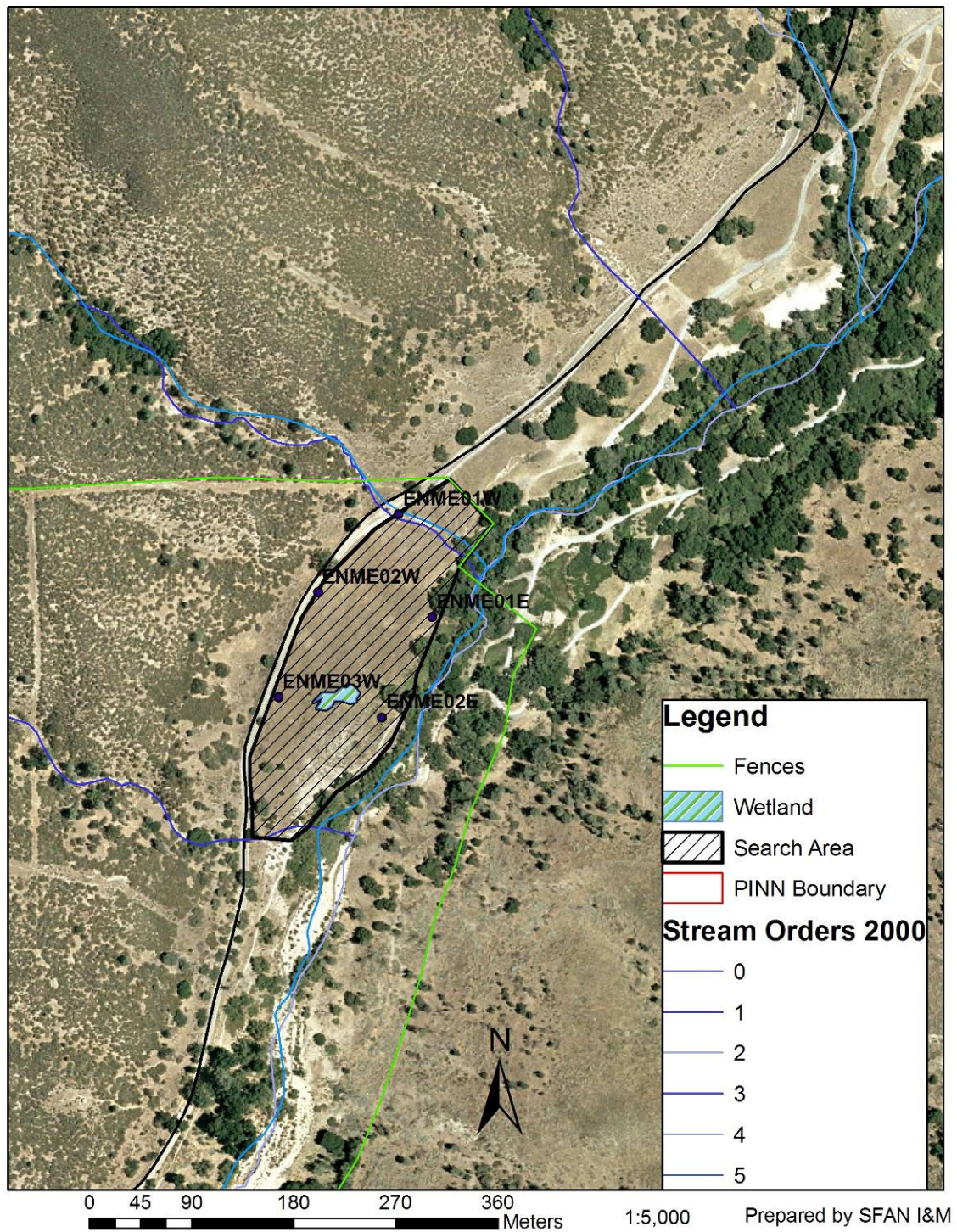


Figure 2. Map of the entrance meadow showing transect locations and wetland area.

Yellow Starthistle Bottomlands—April 6

There were two major purposes for this survey: compile a species list for the bottomlands (partly to help direct management to areas with higher remnant biodiversity), and get pre-management baseline information. Because the airstrip had been under different management prescription than other portions of this former ranchland, it was inventoried first. Nested frequency quadrats were placed every 5 or 10m along a transect across the airstrip (from the fenceline on the east to the west side). Transects were placed systematically every 100m with a random start (random number from same table) from the junction with the southern fenceline. The airstrip transects started 51m north along the eastern fence from the junction; the east side started 61m north of the junction. Ten transects were placed inside the airstrip and five along the east, due to the shape of the yellow starthistle infestation. Andrea Williams read nested frequency plots along transects A01, A03, A05, and A06; Sara Ellebracht was her recorder. After training on the technique with Andrea for the first transect, Jane Rodgers, Ellen Hamingson, and Aaron Schusteff read plots along A02 and A04. Note that only the first six plots were read; a return visit in July found that species were too dessicated for confident identification and further sampling, although forensic botany did show that frequency remained consistent for *Bromus*, *Centaurea*, and *Hirschfeldia* species (the read, in this case, counted rooted species dead or alive—in contrast with the April read that counted live plants only).

While nested frequency plots were being read, the remaining persons (Will Wright and Sharon Franklet—morning only, Elizabeth Speith, Esperanza Hernandez, Janet Cicero, Goniela Iskali, Andrew Clapp, Joy Durighello, Justin Holgerson, Frieda Caldwell, Stella Yang and Edie Nelson) spaced evenly along the southern fence of the airstrip and walked north, flagging unknown species. Stella Yang and Sharon Franklet were identifying botanists, who checked flags and identified species. Janet Cicero recorded species seen. The search took much less time than transects, so searchers covered two additional areas. First, they lined up along the fence southeast of the airstrip and walked south to a clump of oaks then shifted east and walked north back to the fence using the same flag and ID methods. In the afternoon, searchers spaced approximately every five meters apart and walked from the eastern airstrip fenceline east to the fenceline at the bottom of the slope, then shifted north and walked west; they walked north and swept once more east and west. Photos were taken of unknowns not positively identified, as well as photos of plots. Because plots took much longer than anticipated, only six were done before the end of the day. After most of the volunteers were done for the day, Andrea, Elizabeth, and Janet went through the pasture and checked and removed the remaining flags, recording any species not yet on the list.

Pinnacles NM Yellow Starthistle Bottomlands

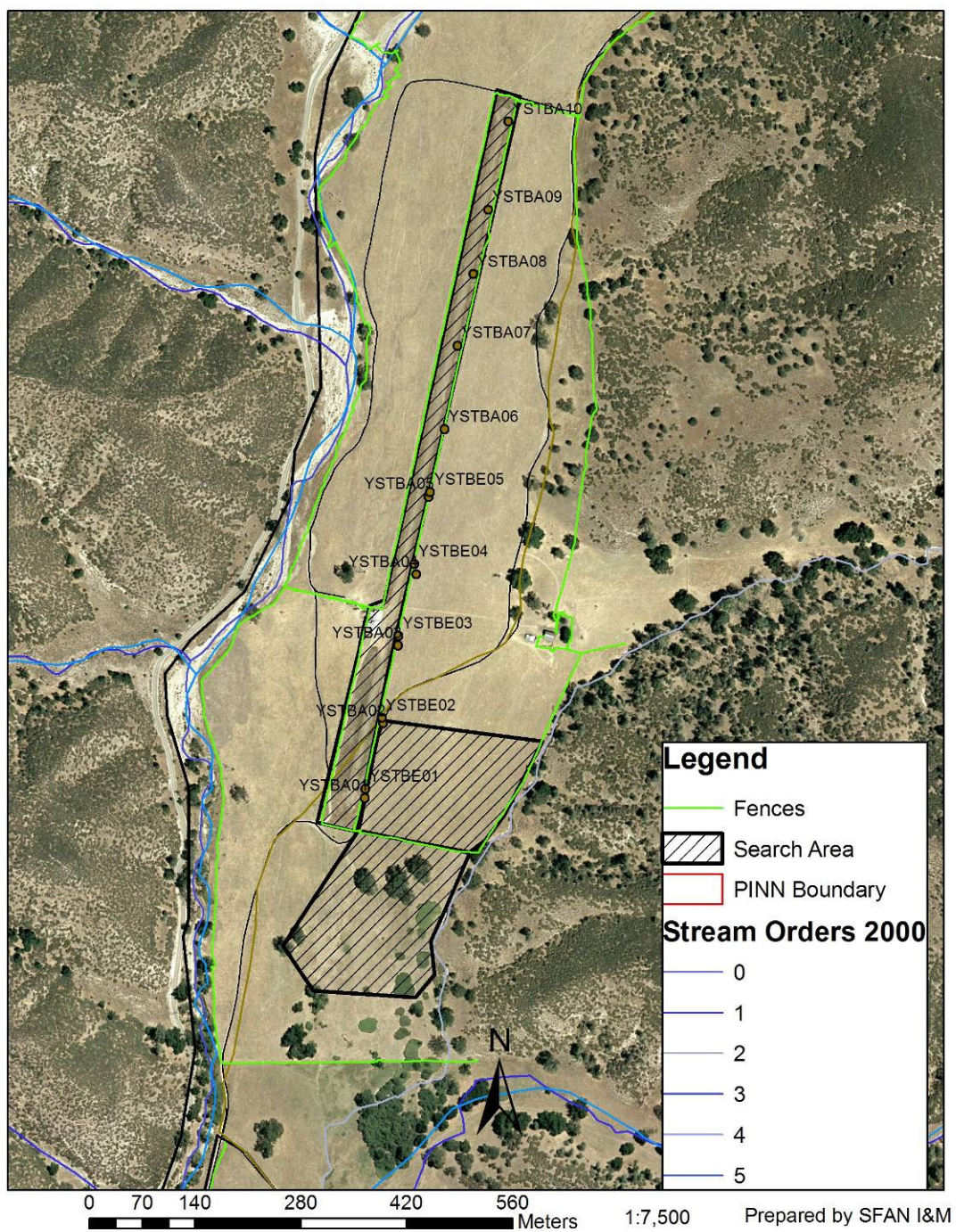


Figure 2. Map of the bottomlands showing transect locations and search areas.



Figure 3. Volunteer Janet Cicero marks the location of an unknown later identified as purple owl's-clover, *Castilleja exserta* ssp. *exserta*.

McCabe Canyon Wetlands—April 7

There were two major purposes for this survey: compile species lists for the wetlands (Seep 1 and Seep 2), and get information on plant community composition (dominant species) for Seep 1. Two point-intercept transects were planned bisecting the upcanyon wetland, Seep 1. The transects were not installed, because the early phenology made identifying species difficult and would have shown potentially misleading cover results by skewing toward nonsenescent species and overestimating bare ground. Instead, more time was spent trying to identify species in the wetlands, and volunteers roved and brought species to key. After compiling the list for Seep 1, the group compiled a list for Seep 2 by walking through the area and recording all species seen. Andrea Williams, Elizabeth Speith, April Allard, Brian and Eileen Keelan, Aaron Schusteff, Dave Nelson, and Joe Rigney participated. Elizabeth Speith mapped the perimeter of each wetland, which was also the search area, and took photos at mapped photopoints.

Pinnacles NM McCabe Canyon

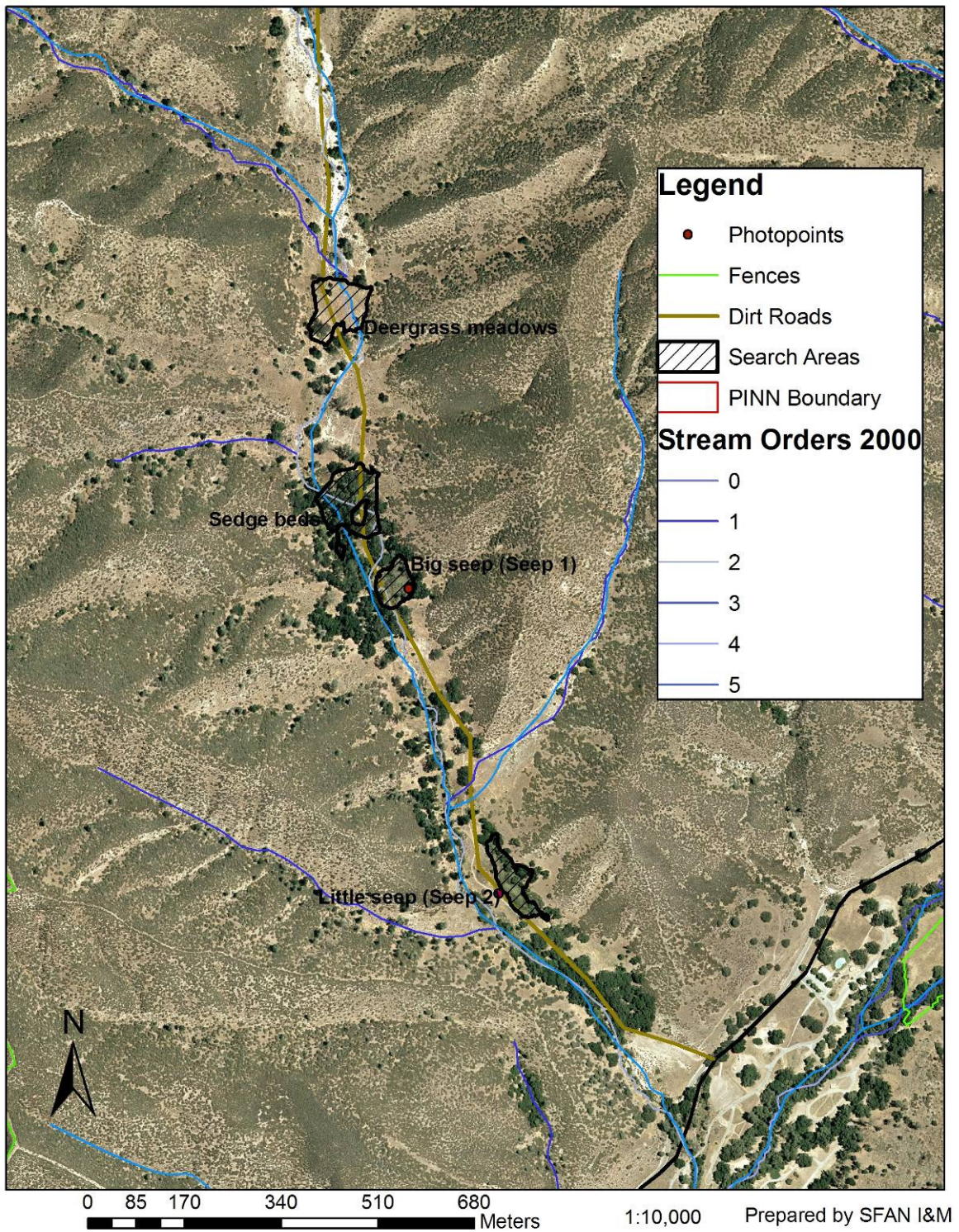


Figure 4. Map of McCabe Canyon showing photopoint locations and search areas.

McCabe Canyon Deergrass Meadow—April 7

The major purpose for this survey was to compile a species list for the meadow. Planned transects to get baseline information on plant community composition and deergrass productivity were not fully fleshed out, as management objectives were not yet formulated for the area. Sharon Franklet gave surveyors Jane Rodgers, Ellen Hamingson, William Wright, Andrew Clapp, Kim Takacs, and Janet Cicero brief plant identification training. The group laid a tape from the large valley oak (SW side of main deergrass area) to the big pine (NW side of main deergrass area), which are 80 m. apart. Starting at 5 meters on the tape, each surveyed one 10m-wide belt transects (0-10m; 10-20m; 20-30m; 30-40m; 40-50m; 60-70m; 70-80m; the 50-60m belt was only partially done) for species, compiling a list and flagging unknowns. Subsequently Sharon identified the bulk of the unknown plants, and all lists were combined.

McCabe Canyon Sedge Beds—April 8

The major purpose for this survey was to compile a species list for the sedge beds. Planned monitoring to get baseline information on plant community composition and sedge productivity or demography were not fully fleshed out, as management objectives were not yet formulated for the area. Andrea Williams gave surveyors Elizabeth Speith, Bruce Delgado, Brian and Eileen Keelan, Jan Shriner, Debbie Delatour, and Janet Cicero brief plant identification training for the most common species: *Carex barbarae*, *Sisymbrium officinale*, *Sanicula crassicaulis*, *Stellaria media*, *Galium aparine*, *Hordeum murinum*, and *Lathyrus vestitus* ssp. *bolanderi*. Since it was also Easter, Andrea hid three Japanese eggplants for an Easter egg-plant hunt, and to test the ability of surveyors to find rare, novel species. The group searched from the elderberry and coyote brush at the base of the slope at the eastern end for species, to the stream channel at the western end, then swept back south and east (keeping to the sedge-dominated areas), calling out species to Andrea compiling the list and flagging unknowns. The group also played botanical “red light, green light” to include random stops and potentially increase the number of species seen. Andrea began, calling “red light,” and surveyors stopped and looked around them at all plant species. Each chose the most novel to call out, and the surveyor with the most interesting plant (according to Andrea) called the next “red light,” and so on. Andrea and Bruce identified the bulk of the unknown plants, and Andrea noted approximate canopy cover classes for species seen in tree, shrub, and ground layers: C, common, >75%; M, moderate, 26-75%; U, uncommon, 1-25%; R, rare, <1%. The final search area was approximately 125m long (north-south) and 100m wide (east-west); this does not include a central sedge-free 40m x 20m area (see Figure 4).

McCabe Canyon—July 26

Andrea Williams and Justin Holgerson made a return trip to McCabe Canyon to install the point-intercept transects in the upcanyon wetland, Seep 1, characterize the two wetlands, and confirm species identifications. A standard FMH 30m 100-point-intercept transect was installed bisecting the wetland: Andrea and Justin stretched a meter-tape across the east-west line at the southern end, and ran a second tape parallel to the eastern slope at the approximate center of that line; Justin chose a random number from the table (14) to be the zero point of the transect; the 30m point (at 340°) is at the base of the small valley oak (*Quercus lobata*) in the interior of the

wetland. Andrea used a seven-foot-long piece of $\frac{1}{4}$ " metal dowel as the pin; standing on the east side of the tape and placing the pin touching the west side, she counted hits only on the west side of the rod. She counted only live plants, and used a folding meter-stick to measure height of tallest hit. After she finished reading the transect, she took a series of photos (NNW, NW, W, SW, S, SE, E, NE, N) at the 15m point of the transect. She wrote a description of the area, then moved on to the lower wetland, wrote a description of it as well, and took photos (bearing cardinal and ordinal directions) at the approximate center.

Results and Discussion

Phenology was a large hurdle for the inventory, with many species not quite flowering. This affected the confidence with which many identifications were made, and a generic name was often used in its stead. In general, the lack of specificity did not impact accomplishment of the overall goals for the project. Future monitoring should take place in May or early June for open areas, and July for wetlands.

Searches yielded 13 potentially new species for the PINN plant list: 7 native, and 6 non-native. Overall, 182 species were noted: 128 native and 50 non-native, and 4 undetermined. Typically, perennials were native (87 of 99); 12 of 13 annual graminoids were exotic, as were 26 of 71 annual forbs. See Appendix A for a full species list. The use of less-skilled botanists was instrumental in covering additional ground and finding novel species. Volunteers did tend to “over-flag,” marking common species they had trained on if those species were in different growth stages, but this added insignificant time for the identifiers.

Table 1. Purported new-to-PINN species seen during the inventory.

Scientific Name	Life-form	Native?	Location	Comments
<i>Aster chilensis</i>	P	Y	Few plants in YST Area 2 (wet meadow)	Confirmed in July visit, Collection # AW-PINN-09
<i>Bromus sterilis</i> *	A/G	N	Entrance Meadow and upper McCabe Canyon	Difficult genus; may be <i>arenarius</i>
<i>Carex densa</i> *	P/G	Y	McCabe Canyon seeps, numerous	Difficult genus; Collection # AW-PINN-02
<i>Carex praegracilis</i> *	P/G	Y	McCabe Canyon Seep 2, few plants	Difficult genus
<i>Convolvulus arvensis</i>	P	N	YST Bottomlands, plots and all sub-areas	Collection # AW-PINN-07
<i>Dactylis glomerata</i>	P/G	N	One clump in eastern edge of sedge beds	Flower heads cut, bagged; clump uprooted and left on site
<i>Erigeron philadelphicus</i>	P	Y	Few plants in YST Area 2 (wet meadow)	Photos 398 and 399
<i>Juncus patens</i> *	P/G	Y	Few plants in sedge beds	Collection # AW-PINN-06
<i>Lactuca saligna</i> *	A	N	YSTB Airstrip	Collection # AW-PINN-08
<i>Phalaris aquatica</i>	P/G	N	One clump in Airstrip	Should remove before burning
<i>Scirpus americanus</i> *	P/G	Y	McCabe Canyon seeps, numerous	Difficult genus; may be <i>pungens</i>
<i>Sisymbrium officinale</i>	A	N	Several plants in sedge beds	
<i>Vicia americana</i> ssp. <i>americana</i>	P	Y	Few plants in sedge beds	

P=Perennial; A=Annual; G=Graminoid; *=Unsure of identification

Entrance Meadow—April 5

The Entrance Meadow is a small grassland grading from California buckwheat (*Eriogonum fasciculatum*) series at the western upslope portion to California annual grassland series for most of the meadow, and into wetland and riparian species in the eastern edge and small patch mapped as “wetland” (see Figure 1). Overall, 66 species were seen; 47 native and 19 exotic. However, exotics were clearly the most frequently occurring species.

Table 2. Frequency results for Entrance Meadow; n=55.

Scientific Name	# of Transects	# of Quadrats	Frequency (1m ²)
<i>Bromus hordeaceus</i>	5	42	76.4%*
<i>Bromus diandrus</i>	5	36	65.5%**
<i>Centaurea solstitialis</i>	5	29	52.7%
<i>Centaurea melitensis</i>	5	24	43.6%
<i>Hirschfeldia incana</i>	5	19	34.5%
<i>Erodium cicutarium</i>	5	14	25.5%
<i>Erodium botrys</i>	4	13	23.6%
<i>Bromus arenarius</i> (sterilis?)	3	11	20.0%
<i>Vulpia myuros</i>	3	10	18.2%
<i>Eriogonum fasciculatum</i> var. <i>foliosum</i>	4	8	14.5%
<i>Eschscholzia californica</i>	3	7	12.7%
<i>Bromus madritensis</i> ssp. <i>rubens</i>	4	7	12.7%
<i>Plagiobothrys nothofulvus</i>	3	5	9.1%
<i>Lupinus bicolor</i>	2	4	7.3%
<i>Juncus balticus</i>	1	3	5.5%
<i>Eriogonum wrightii</i> var. <i>subscaposum</i>	2	3	5.5%
<i>Lotus purshianus</i> var. <i>purshianus</i>	2	3	5.5%
<i>Clarkia</i> sp.	1	2	3.6%
<i>Lactuca serriola</i> ?	1	2	3.6%
<i>Artemisia dracunculus</i>	2	2	3.6%
<i>Cerastium glomeratum</i>	2	2	3.6%
<i>Rumex crispus</i>	2	2	3.6%
<i>Agoseris retrorsa</i>	1	1	1.8%
<i>Amsinckia menziesii</i> var. <i>intermedia</i>	1	1	1.8%
<i>Avena fatua</i>	1	1	1.8%
<i>Calindrinia ciliata</i>	1	1	1.8%
<i>Claytonia</i> sp.	1	1	1.8%
<i>Elymus glaucus</i> ssp. <i>glaucus</i>	1	1	1.8%
<i>Hypochaeris glabra</i> ?	1	1	1.8%
<i>Rosa californica</i>	1	1	1.8%
<i>Rumex salicifolius</i>	1	1	1.8%

**Bromus hordeaceus* had a frequency of 70.9% for 0.5m², 65.5% for 0.25m², and 47.3% for 0.1m²

***Bromus diandrus* had a frequency of 52.7% for 0.5m²

Non-native species greatly dominate the meadow—the most frequent species encountered were cheatgrasses, starthistles, mustards and geraniums. Only the seemingly hardiest natives, or those most able to take advantage of disturbance, have been able to survive in any numbers. If the objective is to restore this meadow to native species, replanting and seeding should focus on these species. Ridding the meadow of *Bromus* may be more costly and time-consuming than the park can afford, and staff may choose to focus on eliminating *Centaurea* species only. In that case, seeding in *Elymus glaucus* and *Hordeum brachyantherum* (the latter especially in wetter low areas) and mulching may help outcompete the exotic grasses and geraniums likely to fill in the areas where starthistles once were.

Table 3. Additional species seen in the Entrance Meadow.

Scientific Name	Lifeform	Native?	Within 5m of Transects	Gridding Only
<i>Adenostoma fasciculatum</i>	S	Y	X	
<i>Artemisia douglasiana</i>	S	Y	X	
<i>Baccharis pilularis</i>	S	Y	X	
<i>Calystegia collina</i> ssp. <i>venusta</i>	P	Y		X
<i>Camissonia contorta</i>	A	N		X
<i>Ceanothus cuneatus</i> var. <i>cuneatus</i>	S	Y	X	
<i>Cercocarpus betuloides</i> var. <i>betuloides</i>	S	Y		X
<i>Chenopodium californicum</i>	P	N	X	
<i>Cirsium occidentale</i>	P	Y		X
<i>Daucus pusillus</i>	A	Y	X	
<i>Dichelostemma capitatum</i> ssp. <i>capitatum</i>	P	Y	X	
<i>Eriodictyon tomentosum</i>	S	Y	X	
<i>Eriogonum nudum</i>	P	Y		X
<i>Erodium brachycarpum</i>	A	N		X
<i>Euthamia occidentalis</i> (Unknown linear-lvd green-smelling comp)	P	Y		X
<i>Galium porrigens</i> var. <i>porrigens</i>	P	Y	X	
<i>Gnaphalium canescens</i> ssp. <i>beneolens</i>	P	Y		X
<i>Lamium amplexicaule</i>	A	N		X
<i>Malacothamnus aboriginum</i>	S	Y		X
<i>Marah fabaceus</i>	P	Y	X	
<i>Marrubium vulgare</i>	P	N		X
<i>Melica imperfecta</i>	P/G	Y		X
<i>Micropus californicus</i> var. <i>californicus</i>	A	Y		X
<i>Pinus sabiniana</i>	T	Y	X	
<i>Prunus ilicifolia</i> ssp. <i>ilicifolia</i>	S	Y		X
<i>Quercus agrifolia</i> var. <i>agrifolia</i>	T	Y	X	
<i>Quercus lobata</i>	T	Y	X	
<i>Salix laevigata</i>	T	Y	X	
<i>Sambucus mexicana</i>	S	Y	X	
<i>Sanicula crassicaulis</i>	P	Y	X	
<i>Solanum umbelliferum</i>	S	Y	X	
<i>Sonchus</i> sp.	A	N		X
<i>Thysanocarpus</i> sp.	A	Y		X
<i>Tropidocarpum gracile</i>	A	Y	X	
<i>Viola pedunculata</i>	P	Y		X

S=Shrub; P=Perennial; A=Annual; G=Graminoid; T=Tree

Two rare species were found at the southwest edge of the search area: *Malacothamnus aboriginum* (below, left) and *Calystegia collina* var. *venustum* (below, right). While species were not flowering, identification is relatively certain.



Figure 5. Rare plant species in the Entrance Meadow.

Yellow Starthistle Bottomlands—April 6

The Yellow Starthistle Bottomlands are lands formerly ranched by the Kingmans. The area is currently characterized by many introduced species, largely annual grasses, forbs, and starthistles, in what was likely a complex of live oak savannah, perennial grasslands, and moist meadows with large California rose thickets. The total of all three areas yielded 57 species: 28 non-native, 27 native, and one of indeterminate origin (*Xanthium strumarium*, purportedly native). Each area had a similar ratio of native to exotic: Area 1 had 17 native, 22 non; Area 2, 14 native, 23 non, one undetermined; Area 3, 12 native and 16 non.

The areas sampled reflect different hydrology and historic management regimes. Area 1, the Airstrip, was mowed more frequently and appears to have higher forb diversity than hydrologically similar Area 3, which appears to have been heavily ranched. The wetter Area 2 showed high native richness on the original visit, and much less starthistle; the July visit indicates starthistle green-up was later than in other areas and the April appearance may have been misleading. Area 2 was certainly the most different: 13 species seen there were not seen in the other two areas. Area 1 had seven species that did not overlap with the other two, while Area 3 had only three species (all native, however) not seen in Areas 1 or 2.

Table 4. Frequency results for the Airstrip. n=6 transects, 32 quadrats.

Scientific Name	# of Transects	# of Quadrats	Frequency (1m ²)	Alternative Frequency (0.5m ²)
<i>Bromus hordeaceus</i>	6	25	78.1%	65.6%*
<i>Bromus diandrus</i>	6	23	71.9%	65.6%**
<i>Centaurea solstitialis</i>	6	22	68.8%	50.0%
<i>Hirschfeldia incana</i>	6	22	68.8%	25.0%
<i>Erodium cicutarium</i>	6	16	50.0%	
<i>Vulpia</i> sp.	6	12	37.5%	
<i>Centaurea melitensis</i>	6	8	34.4%	
<i>Lamium amplexicaule</i>	5	11	25.0%	
<i>Amsinckia menziesii</i> var. <i>intermedia</i>	3	5	15.6%	
<i>Lupinus bicolor</i>	3	4	12.5%	
<i>Lotus purshianus</i> var. <i>purshianus</i>	3	3	9.4%	
<i>Plagiobothrys canescens</i>	2	3	9.4%	
<i>Medicago polymorpha</i>	2	2	6.3%	
<i>Agoseris grandiflora</i>	2	2	6.3%	
<i>Capsella bursa-pastoris</i>	1	1	3.1%	
<i>Cerastium glomeratum</i>	1	1	3.1%	
<i>Lactuca saligna?</i>	1	1	3.1%	
<i>Convolvulus arvensis</i>	1	1	3.1%	

**Bromus hordeaceus* had a frequency of 46.9% for 0.25m²

***Bromus diandrus* had a frequency of 50.0% for 0.25m²



Figure 6. *Erigeron philadelphicus*, photographed in the wet meadow area (Area 2) of the bottomlands, is one of the species that was added to PINN's flora.

On revisit in July, searchers noted that a new road now passed through the airstrip, and that park stock (two horses and two mules) were now being pastured in the bottomlands. While the

handlers undoubtedly know the dangers yellow starthistle poses to horses and mules, they should also be aware and very careful of the possibility of transferring weeds on stock, tack, and equipment. Best management practices must be employed to avoid spreading noxious weeds.

Table 5. Additional species seen in the Yellow Starthistle Bottomlands.

Scientific Name	Lifeform	Native	Area 1	Area 2	Area 3	Comments
<i>Agoseris grandiflora</i>	P	Y	X			
<i>Amsinckia menziesii</i>	A	Y	X	?	X	
<i>Artemisia dracunculul</i>	P	Y	X	X	X	
<i>Asclepias fascicularis</i>	P	Y	X	X		
<i>Aster chilensis</i>	P	Y		X		New; coll #AW-PINN-09
<i>Avena fatua</i>	A/G	N	X			
<i>Bromus diandrus</i>	A/G	N	X	X	X	
<i>Bromus hordeaceus</i>	A/G	N	X	X	X	
<i>Capsella bursa-pastoris</i>	A	N	X			
<i>Castilleja exserta</i> ssp. <i>exserta</i>	A	Y			X	
<i>Centaurea melitensis</i>	A	N	X	X	X	
<i>Centaurea solstitialis</i>	A	N	X	X	X	
<i>Cerastium glomeratum</i>	A	N	X	X	X	
<i>Chenopodium californicum</i>	P	N		X	X	
<i>Clarkia</i> sp.	A	Y			X	
<i>Convolvulus arvensis</i>	P	N	X	X	X	New; coll #AW-PINN-07
<i>Datura wrightii</i>	P	Y	X			
<i>Eleocharis macrostachya</i>	P/G	Y		X		
<i>Elymus glaucus</i> ssp. <i>glaucus</i>	P/G	Y	X			
<i>Eremocarpus setigerus</i>	A	Y	X		X	
<i>Erigeron philadelphicus</i>	P	Y		X		New
<i>Erodium cicutarium</i>	A	N	X	X	X	
<i>Eschscholzia californica</i>	A	Y	X	X	X	
<i>Geranium dissectum</i>	A	N		X		
<i>Heliotropium curassavicum</i>	P	Y	(X)	X		Unknown portulacaceous img 409-410 listed as <i>Deinandra lobbii</i> , unaccepted syn.
<i>Hemizonia lobbii</i>	A	Y	?			
<i>Hirschfeldia incana</i>	P	N	X	X	X	
<i>Hordeum murinum</i>	A/G	N	X	X	X	Difficult genus
<i>Hypochaeris glabra</i>	A	N	X		X	
<i>Juncus balticus</i>	P/G	Y		X		
<i>Lactuca saligna</i>	A	N	?			New (potentially); young pls; coll #AW-PINN-08
<i>Lactuca serriola</i>	A	N	X	X		Very young pls
<i>Lamium amplexicaule</i>	A	N	X	X	X	
<i>Lepidium nitidum</i> var. <i>nitidum</i>	A	Y	X	X	X	
<i>Lotus purshianus</i> var. <i>purshianus</i>	A	Y	X		X	
<i>Lupinus bicolor</i>	A	Y	X		X	
<i>Marrubium vulgare</i>	P	N	X	X	X	
<i>Medicago polymorpha</i>	A	N	X	X	X	
<i>Phacelia distans</i>	A	Y			?	Difficult genus
<i>Phalaris aquatica</i>	P/G	N	X			New
<i>Plagiobothrys canescens</i>	A	Y	X		X	
<i>Quercus lobata</i>	T	Y		X		
<i>Rosa californica</i>	S	Y		X		
<i>Rumex crispus</i>	P	N	X	X		

Scientific Name	Lifeform	Native	Area 1	Area 2	Area 3	Comments
<i>Rumex salicifolius</i>	P	Y	X	X	X	Not flowering
<i>Silybum marianum</i>	A	N		X		
<i>Sonchus</i> sp.	A	N	?	?		Very young pl
<i>Stachys bullata</i>	P	Y	X			
<i>Stellaria media</i>	A	N		X		
<i>Veronica persica</i>	A	N		X		
<i>Vulpia bromoides</i>	A/G	N	?	?	?	Difficult genus
<i>Vulpia myuros</i>	A/G	N	?	?	?	Difficult genus
<i>Vulpia</i> sp.	A/G	N	X	X	X	Difficult genus
						Not fl; originally recorded as <i>Anemopsis californica</i>
<i>Wyethia helenioides</i>	P	Y		?		
<i>Xanthium strumarium</i>	A	Y?		X		

P=Perennial; A=Annual; G=Graminoid; T=Tree; S=Shrub; (X)=noted on revisit

McCabe Canyon Wetlands—April 7 and July 26

Much of the area description for the seeps come from the July revisit, when phenology was more proper for characterization. Both had, at that time, the majority of species flowering, and retained standing water. Overall, the seeps had 54 native and 20 non-native species, with 4 undetermined (*Galium aparine* may be of either origin; three unknowns could not be determined to species and could therefore be native or exotic).

Seep 1, also known as Big Seep, is characterized by abundant spikerush (*Eleocharis*) clumps, with occasional Pacific rush (*Juncus effusus* var. *pacificus*) and dense sedge (*Carex densa*) clumps. Field mint (*Mentha arvensis*) is the main dominant dicot, with dotted smartweed (*Polygonum punctatum*), short-spike hedge nettle (*Stachys pycnantha*) and hoary stinging nettle (*Urtica dioica* ssp. *holoserica*) locally common. Other common forbs include wild celery (*Apium graveolens*?) and marsh pennywort (*Hydrocotyle umbellata*?), with occasional common monkeyflower (*Mimulus guttatus*), western thistle (*Cirsium occidentale*), and marsh baccharis (*Baccharis salicifolia* or *douglasii*). Shrubs are mainly limited to the periphery, and include California rose (*Rosa californica*), California blackberry (*Rubus ursinus*), and coyote brush (*Baccharis pilularis*). The east side shows more pig damage, as well as small pockets of bracken fern (*Pteridium aquilinum*). The west side appears drier; Pacific rush is more common, with some pockets of hyssop loosestrife (*Lythrum hyssopifolium*), skunkweed (*Navarretia squarrosa*?), silver hairgrass (*Aira caryophyllea*), and coast tarweed (*Madia sativa*). Seep 1 had 52 native, 16 non-native, and four undetermined species.



Figure 7. Looking south from the middle of Seep 1.

Table 6. Transect results from Seep 1.

Scientific Name	Lifeform	Native	# Hits	% Tallest	Avg. Ht. (m)	Comments
<i>Eleocharis parishii</i>	P/G	Y	78	47	0.33	Difficult genus Originally recorded as
<i>Mentha arvensis</i>	P	Y	46	4	0.53	<i>Monardella villosa</i>
<i>Juncus effusus</i> var. <i>pacificus</i>	P/G	Y	34	30	0.83	
<i>Polygonum punctatum</i>	A	Y	14	1	0.42	Det on revisit Some confusion with young
<i>Cyperus niger</i>	P/G	Y	13	4	0.19	<i>Scirpus microcarpus</i>
<i>Apium graveolens</i> (Unknown Apiaceous hollow-std)	P	N	10	0		
<i>Hydrocotyle umbellata</i>	P	Y	9	0		Difficult genus
<i>Scirpus microcarpus</i>	P/G	Y	8	3	0.6	
<i>Stachys pycnantha</i>	P	Y	8	0		Very young pl
<i>Carex barbarae</i>	P/G	Y	6	2	0.26	
<i>Baccharis salicifolia</i> ?	P	Y	5	1	1.1	douglasii may also be present New (potentially); difficult genus
<i>Carex densa</i>	P/G	Y	5	0		
<i>Cardamine oligosperma</i>	A	Y	4	6	1.1	
<i>Juncus xiphioides</i>	P/G	Y	4	1	0.21	Difficult genus
<i>Mimulus guttatus</i>	P	Y	4	0		
<i>Rosa californica</i>	S	Y	2	0		
<i>Scirpus americanus</i>	P/G	Y	2	0		New (potentially); difficult genus; may be pungens
<i>Veronica peregrina</i> ssp. <i>xalapensis</i>	A	Y	2	0		
<i>Urtica dioica</i> ssp. <i>holosericea</i>	P	Y	1	1	1.4	
TOTAL			255	100	0.56	



Figure 8. Seep 2 looking southeast.

Although Seep 2 is also known as Little Seep, it is the larger of the two. Fed by a small spring on the northeast hillside, this long, narrow wetland is ringed by sprawling willows (*Salix laevigata*

and *S. lasiolepis*) and Pacific rush; occasional large whiteroot or Santa Barbara sedge (*Carex barbarae*) are noteworthy. Hoary stinging nettle is patchily abundant around edges, while clumps of dense sedge and marsh baccharis are more dominant in the center. The central portion of the wetland also has standing water and lesser duckweed (*Lemna minor*), some marsh pennywort, and dotted smartweed. Contrasting strongly with Seep 1, Seep 2 has little field mint and few clumps of short-spike hedge nettle. Coast tarweed is found in higher numbers along the western edge. Seep 2 had 29 native, 12 non-native, and one undetermined species.

Table 7. Species seen in the McCabe Canyon Wetlands.

Scientific Name	Lifeform	Native?	Seep 1	Seep 2	Comment
<i>Amsinckia menziesii</i>	A	Y	X		
<i>Anagallis arvensis</i>	A	N	X		
<i>Apium graveolens?</i> (Unknown Apiaceous hollow-std)	P	N	X		Thought to be celery on return visit; coll #AW-PINN-03
<i>Artemisia douglasiana</i>	S	Y	X	X	
<i>Artemisia dracunculus</i>	P	Y	X	X	
<i>Azolla filiculoides</i>	P	Y	X		
<i>Baccharis douglasii</i>	P	Y	?	?	Difficult to tell from <i>salicifolia</i>
<i>Baccharis pilularis</i>	S	Y	X	X	
<i>Baccharis salicifolia</i>	P	Y	X	X	
<i>Bromus diandrus</i>	A/G	N	X	X	
<i>Bromus hordeaceus</i>	A/G	N	X	X	
<i>Camissonia graciliflora</i>	A	Y	X		Not flowering
<i>Cardamine oligosperma</i>	A	Y	X	X	
<i>Carex barbarae</i>	P/G	Y	X	X	
<i>Carex densa</i>	P/G	Y	X	X	New (potentially); difficult genus; coll #AW-PINN-02
<i>Carex praegracilis</i>	P/G	Y	?		New (potentially); difficult genus
<i>Cerastium glomeratum</i>	A	N	X	X	
<i>Chlorogalum pomeridianum</i> var. <i>pomeridianum</i>	P	Y	X		
<i>Cirsium occidentale</i>	P	Y	X		
<i>Cirsium vulgare</i>	B	N		X	
<i>Claytonia perfoliata</i> ssp. <i>perfoliata</i>	A	Y	X		
<i>Cuscuta californica</i> var. <i>californica</i>	A	Y	X		On <i>Polygonum punctatum</i> ; only seen on revisit; coll #AW-PINN-04a
<i>Cyperus eragrostis</i>	P/G	Y	X		
<i>Cyperus niger</i>	P/G	Y	X		Some confusion with young <i>Scirpus</i> <i>microcarpus</i>
<i>Eleocharis macrostachya</i>	P/G	Y	X	?	Difficult genus
<i>Eleocharis parishii</i>	P/G	Y	X	X	
<i>Epilobium densiflorum</i> .	A	Y	X		Coll #AW-PINN-05
<i>Epilobium</i> sp.	A	Y	X		Not <i>densiflorum</i> ; poss. <i>ciliatum</i>
<i>Euthamia occidentalis</i> (Unknown linear-lvd green-smelling comp)	P	Y	X	X	
<i>Galium aparine</i>	A	Y/N	X		
<i>Galium parisiense</i>	A	N	X		
<i>Galium porrigens</i> var. <i>porrigens</i>	P	Y	X		Nearby
<i>Gnaphalium californicum</i>	P	Y	X		
<i>Hordeum murinum</i>	A/G	N	?		Difficult genus

Scientific Name	Lifeform	Native?	Seep 1	Seep 2	Comment
<i>Hordeum</i> sp.	A/G	N	X		Difficult genus
<i>Hydrocotyle umbellata</i>	P	Y	?	?	Difficult genus
<i>Iris</i> sp.	P	Y?	?		Likely <i>Juncus phaeocephalus</i> or <i>xiphioides</i> (no fl, no iris on revisit)
<i>Juncus balticus</i>	P/G	Y	X	X	
<i>Juncus effusus</i> var. <i>pacificus</i>	P/G	Y	X	X	
<i>Juncus phaeocephalus</i> var. <i>paniculatus</i>	P/G	Y	?	?	Difficult genus
<i>Juncus xiphioides</i>	P/G	Y	X	?	Difficult genus; coll #AW-PINN-01
<i>Lemna minor</i>	P	Y	?	?	Difficult genus
<i>Marrubium vulgare</i>	P	N		X	
<i>Medicago polymorpha</i>	A	N	?	?	
<i>Melilotus</i> sp.	A	N	?	?	
<i>Mimulus guttatus</i>	P	Y	X	X	
<i>Mentha arvensis</i>	P	Y	X	X	Originally recorded as <i>Monardella villosa</i> ssp. <i>villosa</i>
<i>Montia fontana</i>	A	Y	X		
<i>Navarretia</i> sp.	A	Y	X		
<i>Nemophila pedunculata</i>	A	Y	?		
<i>Pinus sabiniana</i>	T	Y	X		
<i>Poa annua</i>	A/G	N	X	X	
<i>Polygonum punctatum</i>	A	Y	X	X	Determined on revisit; coll #AW-PINN-04b
<i>Potentilla glandulosa</i> ssp. <i>glandulosa</i>	P	Y	?		Not flowering
<i>Pteridium aquilinum</i> var. <i>pubescens</i>	P	Y	X	X	
<i>Quercus agrifolia</i> var. <i>agrifolia</i>	T	Y	X	X	
<i>Quercus lobata</i>	T	Y	X	X	
<i>Rorippa nasturtium-aquaticum</i>	P	Y	X		Determined on revisit
<i>Rosa californica</i>	S	Y	X	X	
<i>Rubus ursinus</i>	S	Y	X	X	
<i>Rumex crispus</i>	P	N	X	X	
<i>Rumex salicifolius</i>	P	Y	X	X	Not flowering
<i>Salix laevigata</i>	T	Y		X	Difficult genus
<i>Salix lasiolepis</i>	T	Y		X	
<i>Sambucus mexicana</i>	S	Y	X		
<i>Sanicula crassicaulis</i>	P	Y	X		
<i>Scirpus americanus</i>	P/G	Y	X	X	New (potentially); difficult genus; may be <i>pungens</i>
<i>Scirpus microcarpus</i>	P/G	Y	X		
<i>Sequoia sempervirens</i>	T	N		X	
<i>Sonchus asper</i> ssp. <i>asper</i>	A	N	X	X	Determined on revisit
<i>Stachys pycnatha</i>	P	Y	X	X	Determined on revisit
<i>Stellaria media</i>	A	N	X		
<i>Trifolium</i> sp.	A	Y?	X		
Unknown Lythraceous shiny-lvd 4-rank	A	Y?	X	X	New (potentially); very young pl, not found on revisit
<i>Urtica dioica</i> ssp. <i>holosericea</i>	P	Y	X	X	
<i>Veronica peregrina</i> ssp. <i>xalapensis</i>	A	Y	X		
<i>Vulpia microstachys</i>	A/G	Y	?		Difficult genus

Scientific Name	Lifeform	Native?	Seep 1	Seep 2	Comment
<i>Vulpia</i> sp.	A/G	N	X		Difficult genus

S=Shrub; P=Perennial; A=Annual; G=Graminoid; T=Tree; B=Biennial

McCabe Canyon Deergrass Meadow—April 7

(Written by Sharon Franklet)

McCabe Canyon runs approximately north-south. The main deergrass (*Muhlenbergia rigens*) section is a sandy stretch approximately 80m long in the N-S direction and 70-80m wide in the E-W direction, with hills rising on both the east and west sides. Substantial numbers of deergrass individuals grow patchily to the south of this main area.

The “main deergrass area” has little canopy cover. Existing tree species are *Quercus lobata* (valley oak), *Quercus agrifolia* (coast live oak), and *Pinus sabiniana* (grey pine). Chaparral shrubs dominate both hillsides and occasionally extend into the flat draw of the main area, including *Adenostoma fasciculatum* (chamise), *Ceanothus cuneatus* var. *c.* (buck brush), and *Eriogonum fasciculatum* var. *foliolosum* (California buckwheat). Associated species on the flat draw include *Artemisia dracunculus* (tarragon), *Rumex salicifolius* (willow dock), *Urtica dioica* ssp. *holosericea* (hoary nettle), *Bromus hordeaceus* (soft chess), and *Erodium cicutarium* (red-stemmed filaree). Native species on the site frequently indicate mesic or wet environments. Soils are sandy to sandy loams, with more organic content occurring nearer to the hillsides. Deergrass appears to be more successful in the sandier soils. Of the 69 species seen, 44 were native; 23 non-native; 2 undetermined (*Galium aparine* and *Xanthium strumarium* may be of either origin). See Table 8 for a full list.

Incipient invasive species include *Centaurea solstitialis* (yellow starthistle) and *Marrubium vulgare* (horehound). Much of the tarragon appears to have a disease or insect infestation that causes distorted, oversized flowering heads. Grazing occurred in the canyon from approximately the latter 1800’s to at least the 1970’s. Further surveys should include measures of the spread of invasives, extent of pig damage, and relationships between soil and species composition.

McCabe Canyon Sedge Beds—April 8

The McCabe Canyon sedge beds have a nearly closed-canopy overstory of native valley and coast live oak, and understory of Santa Barbara sedge. Also known as whiteroot, the abundance and evenness of the sedge cover—especially when contrasted with the large, pedestalled clumps further downcanyon—suggests tending may have been a practice in the area. Other moderately common species include ripgut brome (*Bormus diandrus*), goosegrass (*Galium aparine*), common chickweed (*Stellaria media*), hillside pea (*Lathyrus vestitus* var. *vestitus*), and Pacific sanicle (*Sanicula crassicaulis*); the



Figure 9. Searchers prepare to grid the Deergrass Meadow.



Figure 10. Botanist Andrea Williams directs searchers in the Sedge Beds.

central, somewhat open area dominated by non-native barley (*Hordeum*, likely *murinum*) was excluded from the search area. The search yielded 80 species: 52 native, 26 non-native, and two undetermined (*Galium aparine* may be of either origin; young *Trifolium* could not be determined to species and could therefore be native or exotic). Many of the “rare” species were seen at edges of the search area.

Table 8. Species seen in the McCabe Canyon Deergrass and Sedge Bed areas.

Scientific Name	Lifeform	Native?	Deergrass	Sedge Beds	Comments
<i>Adenostoma fasciculatum</i>	S	Y	X	R	
<i>Amsinckia menziesii</i>	A	Y	X	R	
<i>Anagallis arvensis</i>	A	N		R	
<i>Arabis glabra</i> var. <i>glabra</i>	A	Y		R	
<i>Artemisia douglasiana</i>	S	Y	X	U	
<i>Artemisia dracunculus</i>	P	Y	X	U	
<i>Asclepias fascicularis</i>	P	Y		U	
<i>Aster radulinus</i>	P	Y		R*	Not flowering [thought to be <i>Artemisia douglasiana</i> on revisit]
<i>Avena barbata</i>	A/G	N	X		
<i>Avena fatua</i>	A/G	N		R*	
<i>Azolla filiculoides</i>	P	Y		R	
<i>Baccharis pilularis</i>	S	Y	X	U	
<i>Baccharis salicifolia</i>	P	Y	X		
<i>Bromus arenarius</i> (<i>sterilis</i> ?)	A/G	N	?	R	New (potentially); difficult genus
<i>Bromus diandrus</i>	A/G	N	X	M	
<i>Bromus hordeaceus</i>	A/G	N	X	R	
<i>Bromus madritensis</i> ssp. <i>rubens</i>	A/G	N	X		
<i>Calandrinia ciliata</i>	A	Y	X		
<i>Camissonia contorta</i>	A	N	X		
<i>Camissonia graciliflora</i>	A	Y	?		Not flowering
<i>Capsella bursa-pastoris</i>	A	N		R	
<i>Cardamine oligosperma</i>	A	Y		R	
<i>Carduus pycnocephalus</i>	A	N		R	
<i>Carex barbarae</i>	P/G	Y	X	C	
<i>Centaurea melitensis</i>	A	N	X	R	
<i>Centaurea solstitialis</i>	A	N	X		
<i>Cerastium glomeratum</i>	A	N		R	
<i>Chenopodium californicum</i>	P	N	X	R	
<i>Chlorogalum pomeridianum</i> var. <i>pomeridianum</i>	P	Y		U	
<i>Cirsium occidentale</i>	P	Y		R	
<i>Cirsium vulgare</i>	B	N		R	
<i>Clarkia</i> sp.	A	Y	X	R	
<i>Claytonia parviflora</i> ssp. <i>parviflora</i>	A	Y		U	
<i>Claytonia perfoliata</i> ssp. <i>perfoliata</i>	A	Y		R	
<i>Claytonia</i> sp.	A	Y	X		

Scientific Name	Lifeform	Native?	Deergrass	Sedge Beds	Comments
<i>Clematis ligusticifolia</i>	P	Y		R	
<i>Dactylis glomerata</i>	P/G	N		R	New; dug up/bagged
<i>Daucus pusillus</i>	A	Y		R	
<i>Descurainia pinnata</i> ssp. <i>menziesii</i>	A	Y	X		
<i>Dichelostemma capitatum</i> ssp. <i>capitatum</i>	P	Y		R	
<i>Eleocharis parishii</i>	P/G	Y		R	Difficult genus
<i>Eriodictyon tomentosum</i>	S	Y	X	R	
<i>Eriogonum fasciculatum</i> var. <i>foliolosum</i>	S	Y	X		
<i>Erodium brachycarpum</i>	A	N	X		
<i>Erodium cicutarium</i>	A	N	X		
<i>Eschscholzia californica</i>	A	Y	X		
<i>Euphorbia spathulata</i>	A	Y	X		Img DSCN8319-20
<i>Galium aparine</i>	A	Y/N	X	M	
<i>Galium porrigens</i> var. <i>porrigens</i>	P	Y	X	R	
<i>Gnaphalium</i> sp.	P	Y	X		
<i>Heterotheca sessiliflora</i>	P	N	X		
<i>Hirschfeldia incana</i>	P	N	X		
<i>Hordeum murinum</i>	A/G	N	X	U	Difficult genus
<i>Hordeum</i> sp.	A/G	N	X		Difficult genus
<i>Hypochaeris glabra</i>	A	N	X		
<i>Juncus balticus</i>	P/G	Y		U	
<i>Juncus effusus</i> var. <i>pacificus</i>	P/G	Y		U	
<i>Juncus patens</i>	P/G	Y		U	New; coll #AW-PINN-06
<i>Juncus phaeocephalus</i> var. <i>paniculatus</i>	P/G	Y		R*	Difficult genus
<i>Juncus</i> sp.	P/G	Y	X		
<i>Juncus xiphioides</i>	P/G	Y		R*	Difficult genus
<i>Lactuca serriola</i>	A	N	X		Very young pls
<i>Lamium amplexicaule</i>	A	N	X	R	
<i>Lathyrus vestitus</i> var. <i>vestitus</i>	P	Y		M	
<i>Lemna minor</i>	P	Y		R	Difficult genus
<i>Leymus triticoides</i>	P/G	Y	X		
<i>Lolium perenne</i>	P/G	N		R*	Difficult genus
<i>Lonicera hispidula</i> var. <i>vacillans</i>	P	Y		R	
<i>Lotus purshianus</i> var. <i>purshianus</i>	A	Y	X		
<i>Lotus scoparius</i> var. <i>scoparius</i>	P	Y	X	R	
<i>Lupinus</i> sp.	A	Y	X		Not flowering
<i>Madia</i> sp.	A	Y		R*	Difficult genus
<i>Marah fabaceus</i>	P	Y	X	U	
<i>Marrubium vulgare</i>	P	N	X	R	
<i>Melica imperfecta</i>	P/G	Y		R	
<i>Melilotus</i> sp.	A	N		R	
<i>Muhlenbergia rigens</i>	P/G	Y	X	U	

Scientific Name	Lifeform	Native?	Deergrass	Sedge Beds	Comments
<i>Nemophila pedunculata</i>	A	Y	?	R	
<i>Pectocarya penicillata</i>	A	Y	X		
<i>Phacelia distans</i>	A	Y	X		
<i>Pholistoma auritum</i> var. <i>auritum</i>	A	Y		R	
<i>Pinus sabiniana</i>	T	Y	X	U	
<i>Plagiobothrys canescens</i>	A	Y	?		
<i>Potentilla glandulosa</i> ssp. <i>glandulosa</i>	P	Y		R	Not flowering
<i>Quercus agrifolia</i> var. <i>agrifolia</i>	T	Y	X	C	
<i>Quercus lobata</i>	T	Y	X	C	
<i>Rorippa curvisiliqua</i>	A	Y	X		
<i>Rosa californica</i>	S	Y		U	
<i>Rubus discolor</i>	S	N		R	
<i>Rubus ursinus</i>	S	Y		U	
<i>Rumex crispus</i>	P	N		U	
<i>Rumex salicifolius</i>	P	Y	X	U	Not flowering
<i>Sambucus mexicana</i>	S	Y		U	
<i>Sanicula crassicaulis</i>	P	Y		M	
<i>Scrophularia californica</i> ssp. <i>floribunda</i>	P	Y		U	
<i>Senecio flaccidus</i> var. <i>douglasii</i>	P	Y	X		
<i>Silene gallica</i>	A	N		R*	
<i>Sisymbrium officinale</i>	A	N		U	New
<i>Solanum umbelliferum</i>	S	Y	X	R	
<i>Sonchus</i> sp.	A	N		R	Very young pl
<i>Stachys bullata</i>	P	Y	X		
<i>Stachys pycnatha</i>	P	Y		R*	Very young pl
<i>Stellaria media</i>	A	N	X	M	
<i>Stephanomeria virgata</i> ssp. <i>pleurocarpa</i>	A	Y	X		
<i>Symphoricarpos mollis</i>	S	Y		R*	Very young pl
<i>Taraxacum officinale</i>	P	N		R	
<i>Thysanocarpus laciniatus</i>	A	Y	X		
<i>Toxicodendron diversilobum</i>	S	Y		R	
<i>Trifolium</i> sp.	A	Y?	X	R	
<i>Tropidocarpum gracile</i>	A	Y	X		
Unknown Asteraceous hairy rosette img DSCN8309-8310	A?	N?	X		
<i>Urtica dioica</i> ssp. <i>holosericea</i>	P	Y	X		
<i>Verbena lasiostachys</i>	P	Y	X		
<i>Vicia americana</i> ssp. <i>americana</i>	P	Y		R	New
<i>Vicia villosa</i> ssp. <i>varia</i>	A	N	X	R*	
<i>Vulpia microstachys</i>	A/G	Y	X		Difficult genus
<i>Vulpia myuros</i>	A/G	N	X		Difficult genus
<i>Vulpia</i> sp.	A/G	N		R	Difficult genus

Scientific Name	Lifeform	Native?	Deergrass	Sedge Beds	Comments
<i>Xanthium strumarium</i>	A	Y?	X		

S=Shrub; P=Perennial; A=Annual; G=Graminoid; T=Tree; ?, *=unsure of identification

Literature Cited

Goslee, S. C. 2006. Behavior of vegetation sampling methods in the presence of spatial autocorrelation. *Plant Ecology* 187(2):203-212.

National Park Service. 1988. Management policies. U.S. Department of Interior, National Park Service, Washington, D.C.

Appendix A: Species List

Scientific Name	Life-form	Native	EnMe-plots	EnMe-gen	YSTB Area 1-plot	YSTB Area 1-gen	YSTB Area2	YSTB Area3	McCabe-Deer-grass	McCabe Sedge Beds	McCabe Seep1	McCabe Seep 2	Comments
<i>Adenostoma fasciculatum</i>	S	Y	~	?					X	R			Too young to tell
<i>Agoseris grandiflora</i>	P	Y			X	X							
<i>Agoseris retrorsa</i>	P	Y	X	X									
<i>Amsinckia menziesii</i>	A	Y	X	X	X	X	?	X	X	R	X		
<i>Anagallis arvensis</i>	A	N								R	X		
<i>Apium graveolens</i>	P	N									X		Unk Apiaceous hollow-std; AW-PINN-03
<i>Arabis glabra</i> var. <i>glabra</i>	A	Y								R			
<i>Artemisia douglasiana</i>	S	Y	~	X					X	U	X	X	
<i>Artemisia dracunculus</i>	P	Y	X	X		X	X	X	X	U	X	X	
<i>Asclepias fascicularis</i>	P	Y				X	X			U			
<i>Aster chilensis</i>	P	Y					X						AW-PINN-09 Thought to be young mugwort on revisit
<i>Aster radulinus</i>	P	Y								R*			
<i>Avena barbata</i>	A/G	N							X				
<i>Avena fatua</i>	A/G	N	X	X		X				R*			
<i>Azolla filiculoides</i>	P	Y								R	X		
<i>Baccharis douglasii</i>	P	Y									?		Difficult to tell from <i>salicifolia</i>
<i>Baccharis pilularis</i>	S	Y	~	X					X	U	X	X	
<i>Baccharis salicifolia</i>	P	Y							X		X	X	
<i>Bromus arenarius</i> (<i>sterilis?</i>)	A/G	N	?	?					?	R			Difficult genus
<i>Bromus diandrus</i>	A/G	N	X	X	X	X	X	X	X	M	X	X	
<i>Bromus hordeaceus</i>	A/G	N	X	X	X	X	X	X	X	R	X	X	
<i>Bromus madritensis</i> ssp. <i>rubens</i>	A/G	N	X	X					X				
<i>Calandrinia ciliata</i>	A	Y	X	X					X				

S=Shrub; P=Perennial; A=Annual; G=Graminoid; T=Tree; B=Biennial; **New to list; Incorrect ID**; X=Present; ?=Unsure of ID; ~=Seen near, not in, plot

Scientific Name	Life-form	Native	EnMe-plots	EnMe-gen	YSTB Area 1-plot	YSTB Area 1-gen	YSTB Area2	YSTB Area3	McCabe-Deer-grass	McCabe Sedge Beds	McCabe Seep1	McCabe Seep 2	Comments
<i>Calystegia collina</i> ssp. <i>venusta</i>	P	Y		X									Rare plant (CNPS 4.3)
<i>Camissonia contorta</i>	A	Y		X					X				
<i>Camissonia graciliflora</i>	A	Y							?		X		Not flowering
<i>Capsella bursa-pastoris</i>	A	N			X	X				R			
<i>Cardamine oligosperma</i>	A	Y								R	X	X	
<i>Carduus pycnocephalus</i>	A	N								R			
<i>Carex barbarae</i>	P/G	Y							X	C	X	X	
<i>Carex densa</i>	P/G	Y									X	X	Difficult genus; AW-PINN-02
<i>Carex prae-gracilis</i>	P/G	Y									?		Difficult genus
<i>Castilleja exserta</i> ssp. <i>exserta</i>	A	Y						X					
<i>Ceanothus cuneatus</i> var. <i>cuneatus</i>	S	Y	~	X									
<i>Centaurea melitensis</i>	A	N	X	X	X	X	X	X	X	R			
<i>Centaurea solstitialis</i>	A	N	X	X	X	X	X	X	X				
<i>Cerastium glomeratum</i>	A	N	X	X	X	X	X	X		R	X	X	
<i>Cercocarpus betuloides</i> var. <i>b.</i>	S	Y		X									
<i>Chenopodium californicum</i>	P	Y	~	X			X	X	X	R			
<i>Chlorogalum pomeridianum</i> var. <i>p</i>	P	Y								U	X		
<i>Cirsium occidentale</i>	P	Y		X						R	X		
<i>Cirsium vulgare</i>	B	N								R		X	
<i>Clarkia</i> sp.	A	Y	X	X				X	X	R			
<i>Claytonia parviflora</i> ssp. <i>p.</i>	A	Y								U			
<i>Claytonia perfoliata</i> ssp. <i>p.</i>	A	Y								R	X		

Scientific Name	Life-form	Native	EnMe-plots	EnMe-gen	YSTB Area 1-plot	YSTB Area 1-gen	YSTB Area2	YSTB Area3	McCabe-Deer-grass	McCabe Sedge Beds	McCabe Seep1	McCabe Seep 2	Comments
<i>Claytonia</i> sp.	A	Y	X	X					X				
<i>Clematis ligusticifolia</i>	P	Y								R			
<i>Convolvulus arvensis</i>	P	N			X	X	X	X					Can be invasive; AW-PINN-07 On <i>Polygonum punctatum</i> ; AW-PINN-04a
<i>Cuscuta californica</i> var. <i>californica</i>	P/G	Y									X		
<i>Cyperus eragrostis</i>	P/G	Y									X		
<i>Cyperus niger</i>	P/G	Y									X		Some confusion with young <i>Scirpus microcarpus</i>
<i>Dactylis glomerata</i>	P/G	N								R			Cut/bagged
<i>Datura wrightii</i>	P	Y				X							
<i>Daucus pusillus</i>	A	Y	~	X						R			
<i>Descurainia pinnata</i> ssp. <i>menziesii</i>	A	Y							X				
<i>Dichelostemma capitatum</i> ssp. <i>capitatum</i>	P	Y	~	X						R			
<i>Eleocharis macrostachya</i>	P/G	Y					X				X		Difficult genus
<i>Eleocharis parishii</i>	P/G	Y								R	X	X	Difficult genus
<i>Elymus glaucus</i> ssp. <i>glaucus</i>	P/G	Y	X	X		X							
<i>Epilobium densiflorum</i>	A	Y									X		AW-PINN-05
<i>Epilobium</i> sp.	A	Y									X		Likely <i>ciliatum</i>
<i>Eremocarpus setigerus</i>	A	Y			~	X		X					
<i>Erigeron philadelphicus</i>	P	Y					X						Photos 398, 399
<i>Eriodictyon tomentosum</i>	S	Y	~	X					X	R			
<i>Eriogonum fasciculatum</i> var. <i>foliolosum</i>	S	Y	X	X					X				

Scientific Name	Life-form	Native	EnMe-plots	EnMe-gen	YSTB Area 1-plot	YSTB Area 1-gen	YSTB Area2	YSTB Area3	McCabe-Deer-grass	McCabe Sedge Beds	McCabe Seep1	McCabe Seep 2	Comments
<i>Eriogonum nudum</i>	P	Y		X									
<i>Eriogonum wrightii</i> var. <i>subscaposum</i>	P	Y	X	X									
<i>Erodium botrys</i>	A	N	X	X									
<i>Erodium brachycarpum</i>	A	N		X					X				
<i>Erodium cicutarium</i>	A	N	X	X	X	X	X	X	X				
<i>Erodium moschatum</i>	A	N			X								
<i>Eschscholzia californica</i>	A	Y	X	X	~	X	X	X	X				
<i>Euthamia occidentalis</i>	P	Y		X							X	X	Unknown linear-lvd green-smelling comp
<i>Euphorbia spathulata</i>	A	Y							X				Img DSCN8319-20
<i>Galium aparine</i>	A	Y/N							X	M	X		
<i>Galium parisiense</i>	A	N									X		
<i>Galium porrigens</i> var. <i>p.</i>	P	Y	~	?					X	R	X		
<i>Geranium dissectum</i>	A	N					X						
<i>Gnaphalium californicum</i>	P	Y									X		
<i>Gnaphalium canescens</i> ssp. <i>beneolens</i>	P	Y		?									Not flowering
<i>Gnaphalium</i> sp.	P	Y							X				
<i>Heliotropium curassavicum</i>	P	Y					X						Unknown portulacaceus Img 409-410 Listed as <i>Deinandra lobbii</i> , unaccepted syn.
<i>Hemizonia lobbii</i>	A	Y					?						
<i>Heterotheca sessiliflora</i>	P	Y							X				
<i>Hirschfeldia incana</i>	P	N	X	X	X	X	X	X	X				
<i>Hordeum murinum</i>	A/G	N			X	X	X	X	X	U	?		Difficult genus
<i>Hordeum</i> sp.	A/G	N							X		X		Difficult genus

Scientific Name	Life-form	Native	EnMe-plots	EnMe-gen	YSTB Area 1-plot	YSTB Area 1-gen	YSTB Area2	YSTB Area3	McCabe-Deer-grass	McCabe Sedge Beds	McCabe Seep1	McCabe Seep 2	Comments
<i>Hydrocotyle umbellata</i>	P	Y										?	
<i>Hypochaeris glabra</i>	A	N	?	?		X		X	X				
<i>Iris</i> sp.	P	Y?									?		May actually be <i>Juncus phae</i> or <i>xiph</i> (no fl)
<i>Juncus balticus</i>	P/G	Y	X	X			X			U	X	X	Difficult genus
<i>Juncus effusus</i> var. <i>pacificus</i>	P/G	Y								U	X	X	Difficult genus
<i>Juncus patens</i>	P/G	Y								U			New; difficult genus; AW-PINN-06
<i>Juncus phaeocephalus</i> var. <i>paniculatus</i>	P/G	Y								R*		?	Difficult genus
<i>Juncus</i> sp.	P/G	Y							X				Difficult genus
<i>Juncus xiphioides</i>	P/G	Y								R*	X	?	Difficult genus; AW-PINN-01
<i>Lactuca saligna</i>	A	N				?							New; young pls; AW-PINN-08
<i>Lactuca serriola</i>	A	N	?	?	~	X	X		X				Very young pls
<i>Lamium amplexicaule</i>	A	N		X	X	X	X	X	X	R			
<i>Lathyrus vestitus</i> var. <i>v.</i>	P	Y								M			
<i>Lemna minor</i>	P	Y								R	?	?	Difficult genus
<i>Lepidium nitidum</i> var. <i>n.</i>	A	Y				X	X	X					
<i>Leymus triticoides</i>	P/G	Y							X				
<i>Lolium perenne</i>	P/G	N								R*			Difficult genus
<i>Lonicera hispidula</i> var. <i>vacillans</i>	P	Y								R			
<i>Lotus crassifolius</i>	P	Y				?							Det. to be <i>Glycyrrhiza</i>
<i>Lotus purshianus</i> var. <i>purshianus</i>	A	Y	X	X	X	X		X	X				
<i>Lotus scoparius</i> var. <i>scoparius</i>	P	Y							X	R			
<i>Lupinus bicolor</i>	A	Y	X	X	X	X		X					

Scientific Name	Life-form	Native	EnMe-plots	EnMe-gen	YSTB Area 1-plot	YSTB Area 1-gen	YSTB Area2	YSTB Area3	McCabe-Deer-grass	McCabe Sedge Beds	McCabe Seep1	McCabe Seep 2	Comments
<i>Lupinus</i> sp.	A	Y							X				Not flowering
<i>Madia</i> sp.	A	Y								R*			Difficult genus
<i>Malacothamnus aboriginum</i>	S	Y		X									Rare: CNPS 1B.2
<i>Marah fabaceus</i>	P	Y	~	X					X	U			
<i>Marrubium vulgare</i>	P	N		X		X	X	X	X	R		X	Invasive
<i>Medicago polymorpha</i>	A	N			X	X	X	X			?	?	
<i>Melica imperfecta</i>	P/G	Y		X						R			
<i>Melilotus</i> sp.	A	N								R	?	?	
<i>Micropus californicus</i> var. <i>c.</i>	A	Y		X									
<i>Mimulus guttatus</i>	P	Y									X	X	
<i>Monardella villosa</i> ssp. <i>v.</i>	P	Y									?	?	
<i>Montia fontana</i>	A	Y									X		
<i>Muhlenbergia rigens</i>	P/G	Y							X	U			
<i>Navarretia</i> sp.	A	Y									X		
<i>Nemophila pedunculata</i>	A	Y							?	R	?		
<i>Pectocarya penicillata</i>	A	Y							X				
<i>Phacelia distans</i>	A	Y						?	X				
<i>Phalaris aquatica</i>	P/G	N			~	X							Should be removed
<i>Pholistoma auritum</i> var. <i>auritum</i>	A	Y								R			
<i>Pinus sabiniana</i>	T	Y	~	X					X	U	X		
<i>Plagiobothrys canescens</i>	A	Y			X	X		X	?				
<i>Plagiobothrys nothofulvus</i>	A	Y	X	X									
<i>Poa annua</i>	A/G	N									X	X	
<i>Polygonum punctatum</i>	A	Y									X	X	Confirmed on revisit; AW-PINN-04b (with dodder)

Scientific Name	Life-form	Native	EnMe-plots	EnMe-gen	YSTB Area 1-plot	YSTB Area 1-gen	YSTB Area2	YSTB Area3	McCabe-Deer-grass	McCabe Sedge Beds	McCabe Seep1	McCabe Seep 2	Comments
<i>Potentilla glandulosa</i> ssp. g.	P	Y								R	?		Not flowering
<i>Prunus ilicifolia</i> ssp. i.	S	Y		X									
<i>Pteridium aquilinum</i> var. <i>pubescens</i>	P	Y									X	X	
<i>Quercus agrifolia</i> var. <i>a.</i>	T	Y	~	X					X	C	X	X	
<i>Quercus lobata</i>	T	Y	~	X			X		X	C	X	X	
<i>Rorippa curvisiliqua</i>	A	Y							X				
<i>Rorippa nasturtium-aquaticum</i>	P	Y									?		
<i>Rosa californica</i>	S	Y	X	X			X			U	X	X	
<i>Rubus discolor</i>	S	N								R			Invasive
<i>Rubus ursinus</i>	S	Y								U	X	X	
<i>Rumex crispus</i>	P	N	X	X	X	X	X			U	X	X	
<i>Rumex pulcher</i>	P	N					X				?		Likely young <i>crispus</i>
<i>Rumex salicifolius</i>	P	Y	X	X		X	X	X	X	U	X	X	Not flowering
<i>Salix laevigata</i>	T	Y	~	?								X	Difficult genus
<i>Salix lasiolepis</i>	T	Y										X	Difficult genus
<i>Sambucus mexicana</i>	S	Y	~	X						U	X		
<i>Sanicula crassicaulis</i>	P	Y	~	X						M	X		
<i>Scirpus americanus</i>	P/G	Y									X	X	Difficult genus; may be <i>pungens</i>
<i>Scirpus microcarpus</i>	P/G	Y									X		
<i>Scrophularia californica</i> ssp. <i>floribunda</i>	P	Y								U			
<i>Senecio flaccidus</i> var. <i>douglasii</i>	P	Y							X				
<i>Sequoia sempervirens</i>	T	N										X	
<i>Silene gallica</i>	A	N								R*			
<i>Silybum marianum</i>	A	N					X						
<i>Sisymbrium officinale</i>	A	N								U			

Scientific Name	Life-form	Native	EnMe-plots	EnMe-gen	YSTB Area 1-plot	YSTB Area 1-gen	YSTB Area2	YSTB Area3	McCabe-Deer-grass	McCabe Sedge Beds	McCabe Seep1	McCabe Seep 2	Comments
<i>Solanum umbelliferum</i>	S	Y	~	X					X	R			
<i>Sonchus asper</i> ssp. <i>a.</i>	A	N										X	
<i>Sonchus</i> sp.	A	N		?	?	?	?			R	?	?	Very young pls
<i>Stachys bullata</i>	P	Y				X			X				
<i>Stachys pycnantha</i>	P	Y								R*	?	?	Very young pl
<i>Stellaria media</i>	A	N					X		X	M	X		
<i>Stephanomeria virgata</i> ssp.													
<i>pleurocarpa</i>	A	Y							X				
<i>Symphoricarpos mollis</i>	S	Y								R*			Very young pl
<i>Taraxacum officinale</i>	P	N								R			
<i>Thysanocarpus laciniatus</i>	A	Y							X				
<i>Thysanocarpus</i> sp.	A	Y		X									
<i>Toxicodendron diversilobum</i>	S	Y								R			
<i>Trifolium</i> sp.	A	Y?							X	R	X		
<i>Tropidocarpum gracile</i>	A	Y	~	?					X				
Unknown													
Asteraceous hairy rosette	A?	N?							X				img DSCN8309-83X0
Unknown													
Lythraceous shiny-lvd 4-rank	A	Y?									X	X	New (potentially); very young pl
<i>Urtica dioica</i> ssp.													
<i>holosericea</i>	P	Y							X		X	X	
<i>Verbena lasiostachys</i>	P	Y							X				
<i>Veronica peregrina</i> ssp. <i>xalapensis</i>	A	Y									X		
<i>Veronica persica</i>	A	N					X						
<i>Vicia americana</i> ssp. <i>a.</i>	P	Y								R			New
<i>Vicia villosa</i> ssp. <i>varia</i>	A	N							X	R*			

Scientific Name	Life-form	Native	EnMe-plots	EnMe-gen	YSTB Area 1-plot	YSTB Area 1-gen	YSTB Area2	YSTB Area3	McCabe-Deer-grass	McCabe Sedge Beds	McCabe Seep1	McCabe Seep 2	Comments
<i>Viola pedunculata</i>	P	Y		X									
<i>Vulpia bromoides</i>	A/G	N			?	?	?	?					Difficult genus
<i>Vulpia microstachys</i>	A/G	Y			?	?			X		?		Difficult genus
<i>Vulpia myuros</i>	A/G	N	X	?	?	?			X				Difficult genus
<i>Vulpia</i> sp.	A/G	N			X	X	X	X		R	X		Difficult genus Not fl; originally recorded as <i>Anemopsis californica</i>
<i>Wyethia helenioides</i>	P	N					?						
<i>Xanthium strumarium</i>	A	Y?					X		X				

Appendix B: Photo Sheets

Pinnacles NM Botany Rave, Entrance Meadow, April 5 2007



IMG_0372.JPG; Ornate tiger moth.
Photo by Andrea Williams



IMG_0373.JPG; Hypochaeris?.
Photo by Andrea Williams



IMG_0374.JPG;
ENME2007040501W 70 TO 0.
Photo by Andrea Williams



IMG_0375.JPG;
ENME2007040501W 0 TO 70.
Photo by Andrea Williams



IMG_0376.JPG;
ENME2007040501E 0 TO 90.
Photo by Andrea Williams



IMG_0377.JPG; Amsinckia
menziesii var. intermedia. Photo
by Andrea Williams



IMG_0378.JPG;
ENME2007040501E 90 TO 0.
Photo by Andrea Williams



IMG_0379.JPG;
ENME2007040502W 0 to 100.
Photo by Andrea Williams



IMG_0380.JPG;
ENME2007040502W 100 to 0.
Photo by Andrea Williams



IMG_0381.JPG; Chenopodium
californicum. Photo by Andrea
Williams



IMG_0382.JPG;
ENME2007040502E 90 to 0.
Photo by Andrea Williams



IMG_0383.JPG; Dichelostemma
capitatum ssp. c. (in Eriogonum
fasciculatum). Photo by Andrea
Williams



IMG_0384.JPG;
ENME2007040502E 0 to 90.
Photo by Andrea Williams



IMG_0385.JPG;
ENME2007040503W 0 to 100.
Photo by Andrea Williams



IMG_0386.JPG; Agoseris retrorsa.
Photo by Andrea Williams



IMG_0387.JPG; Gnaphalium
canescens ssp. beneolens. Photo
by Andrea Williams



IMG_0388.JPG;
ENME2007040503W 100 to 0.
Photo by Andrea Williams



IMG_0389.JPG; Senecio flaccidus
var. douglasii?. Photo by Andrea
Williams



IMG_0390.JPG; Micropus
californicus (on red pin flag/wire
flag). Photo by Andrea Williams



IMG_0391.JPG; Micropus
californicus. Photo by Andrea
Williams



IMG_0392.JPG; Malacothamnus
aboriginum. Photo by Andrea
Williams



IMG_0393.JPG; Calystegia collina
ssp. venusta. Photo by Andrea
Williams



IMG_0395.JPG; Nymphalis ca.
(CA tortoiseshell) larvae on
Ceanothus cuneatus var. cu...
Photo by Andrea Williams



DSCN2385.JPG; Nested frequency plot frame assembly. Photo by Elizabeth Speith



DSCN2386.JPG; Surveying the airstrip. Photo by Elizabeth Speith



DSCN2387.JPG; Sharon Franklet rummages and Janet Cicero records. Photo by Elizabeth Speith



DSCN2388.JPG; Will Wright, the well-prepared surveyor. Photo by Elizabeth Speith



DSCN2389.JPG; Surveyors at the north end of the airstrip. Photo by Elizabeth Speith



DSCN2390.JPG; Volunteer Edie Nelson flags an unknown while Joy Durighello and Justin Holgerson look on. Photo by Elizabeth Speith



DSCN2391.JPG; Edie Nelson, Joy Durighello and Justin Holgerson. Photo by Elizabeth Speith



DSCN2392.JPG; Stella Yang, Andrea Williams, and Aaron Schusteff discuss an unknown. Photo by Elizabeth Speith



DSCN2393.JPG; Stella Yang, Andrea Williams, and Aaron Schusteff discuss an unknown. Photo by Elizabeth Speith



DSCN2394.JPG; Stella Yang, Andrea Williams, and Aaron Schusteff discuss an unknown. Photo by Elizabeth Speith



DSCN2395.JPG; Surveyors lunch in the shade of oaks. Photo by Elizabeth Speith



DSCN2396.JPG; Surveyors prepare to grid Area 2, south of the airstrip. Photo by Elizabeth Speith



DSCN2397.JPG; Surveyors prepare to grid Area 2, south of the airstrip. Photo by Elizabeth Speith



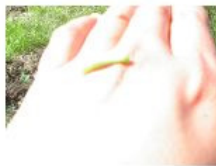
DSCN2398.JPG; Stella Yang identifying an unknown. Photo by Elizabeth Speith



DSCN2399.JPG; Unknown caterpillar (Sara orangetip?). Photo by Elizabeth Speith



DSCN2400.JPG; Unknown caterpillar (Sara orangetip?). Photo by Elizabeth Speith



DSCN2401.JPG; Unknown caterpillar (Sara orangetip?). Photo by Elizabeth Speith



IMG_0396.JPG; YSTB20070406A01 0 TO 45. Photo by Andrea Williams



IMG_0397.JPG; YSTB20070406A01 45 TO 0. Photo by Andrea Williams



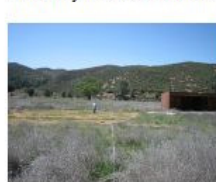
IMG_0398.JPG; Erigeron philadelphicus. Photo by Andrea Williams



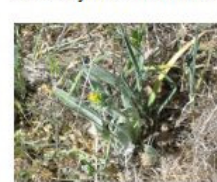
IMG_0399.JPG; Erigeron philadelphicus. Photo by Andrea Williams



IMG_0400.JPG; Agoseris grandiflora. Photo by Andrea Williams



IMG_0401.JPG; YSTB20070406A03 0 TO 45. Photo by Andrea Williams



IMG_0402.JPG; Agoseris grandiflora. Photo by Andrea Williams



IMG_0403.JPG; YSTB20070406A03 45 TO 0. Photo by Andrea Williams

Pinnacles NM Botany Rave, YST Bottomlands, April 6 2007



IMG_0404.JPG;
YSTB20070406A05 0 TO 30.
Photo by Andrea Williams



IMG_0405.JPG;
YSTB20070406A05 30 TO 0.
Photo by Andrea Williams



IMG_0406.JPG;
YSTB20070406A06 0 TO 30.
Photo by Andrea Williams



IMG_0407.JPG;
YSTB20070406A06 30 TO 0.
Photo by Andrea Williams



IMG_0408.JPG; Jane Rodgers and
Aaron Schusteff keeping hydrated
in style!. Photo by Andrea
Williams



IMG_0409.JPG; Heliotropium
curassavicum. Photo by Andrea
Williams



IMG_0410.JPG; Heliotropium
curassavicum. Photo by Andrea
Williams



IMG_0411.JPG; Euthamia
occidentalis (the unk linear-lvd
green-smelling compl). Photo by
Andrea Williams



IMG_0412.JPG; Euthamia
occidentalis area/habitat. Photo by
Andrea Williams



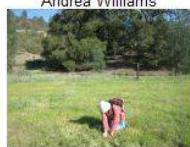
IMG_0413.JPG; Phacelia
distans?. Photo by Andrea
Williams



IMG_0414.JPG; Castilleja exserta
ssp. exserta. Photo by Andrea
Williams



IMG_0415.JPG; Castilleja exserta
ssp. exserta. Photo by Andrea
Williams



IMG_0416.JPG; Janet Cicero
shows the location of Castilleja
exserta ssp. e.. Photo by Andrea
Williams



IMGP2399.JPG; Training in
common plant ID before surveys
begin. Photo by Elizabeth Speith



IMGP2402.JPG; Training in
common plant ID before surveys
begin. Photo by Elizabeth Speith

Pinnacles NM Botany Rave, McCabe Canyon Seeps, April 7 2007



DSCN2402.JPG; Keying plants at Big
Seep. Photo by Elizabeth Speith



DSCN2403.JPG; Keying plants at Big
Seep. Photo by Elizabeth Speith



DSCN2404.JPG; Keying plants at Big
Seep. Photo by Elizabeth Speith



DSCN8012.JPG; Seep 1, Big Seep. Photo
by Joe Rigney



DSCN8013.JPG; Seep 1, Big Seep. Photo
by Joe Rigney



DSCN8014.JPG; Seep 1, Big Seep. Photo
by Joe Rigney



DSCN8015.JPG; Seep 1, Big Seep. Photo
by Joe Rigney



IMG_0417.JPG; Callophrys augustinus?,
brown elfin, at big seep in McCabe cyn.
Photo by Andrea Williams



IMG_0418.JPG; Hyles lineata, white-lined
sphinx, at big seep in McCabe cyn. Photo
by Andrea Williams



IMG_0419.JPG; Hyles lineata, white-lined
sphinx, watering at big seep in McCabe
cyn. Photo by Andrea Williams



IMG_0420.JPG; Carex densa?. Photo by
Andrea Williams



IMG_0421.JPG; Carex densa?. Photo by
Andrea Williams



IMG_0422.JPG; Scirpus americanus?
pungens?. Photo by Andrea Williams



IMG_0423.JPG; Baccharis salicifolia?
douglasii?. Photo by Andrea Williams



IMG_0424.JPG; Unknown lythraceous
shiny-lvd 4-ranked. Photo by Andrea
Williams



IMG_0425.JPG; Seep 2 ("Little Seep")
photopoint; 340 degrees 0 declination.
Photo by Andrea Williams



IMG_0426.JPG; Seep 2 ("Little Seep")
photopoint; 45 degrees 0 declination. Photo
by Andrea Williams



IMG_0427.JPG; Seep 2 ("Little Seep")
photopoint; 80 degrees 0 declination. Photo
by Andrea Williams



DSCN8298.JPG; *Rorippa curvisiliqua*.



DSCN8299.JPG; *Vicia villosa*.



DSCN8300.JPG; *Camissonia contorta*.



DSCN8301.JPG; *Camissonia contorta*.



DSCN8302.JPG; The Deergrass crew: Sharon Franklet, Andrew Clapp, Justin Holgerson, Ellen



DSCN8303.JPG; The Deergrass crew: Sharon Franklet, Andrew Clapp, Justin Holgerson, Ellen



DSCN8304.JPG; Sharon Franklet and Ellen Hamingson at work.



DSCN8305.JPG; Sharon Franklet and Will Wright study vegetation.



DSCN8306.JPG; Aaron Schusteff examines a plant.



DSCN8307.JPG; Janet Cicero studies a *Vulpia*.



DSCN8308.JPG; The unknown *Vulpia: microstachys?*.



DSCN8309.JPG; Unknown #2,3; young comp?. Photo by Sharon Franklet?



DSCN8310.JPG; Unknown #2,3; young comp?. Photo by Sharon Franklet?



DSCN8311.JPG; Jane Rodgers checks her list twice. Photo by Sharon Franklet?



DSCN8312.JPG; Will Wright, Sharon Franklet, Justin Holgerson, Andrew Clapp, and Jane Rodgers



DSCN8313.JPG; Jane Rodgers checks her list twice. Photo by Sharon Franklet?



DSCN8314.JPG; . Photo by Sharon Franklet?



DSCN8315.JPG; Janet Cicero looking up the *Vulpia*. Photo by Sharon Franklet?



DSCN8316.JPG; Unknown *Trifolium*. Photo by Sharon Franklet?



DSCN8317.JPG; *Rorippa curvisiliqua*. Photo by Sharon Franklet?



DSCN8318.JPG; *Rorippa curvisiliqua*. Photo by Sharon Franklet?



DSCN8319.JPG; *Euphorbia spathulata*. Photo by Sharon Franklet?



DSCN8320.JPG; *Euphorbia spathulata*. Photo by Sharon Franklet?



DSCN8321.JPG; *Senecio flaccidus* var. *douglasii*?. Photo by Sharon Franklet?



DSCN8322.JPG; *Senecio flaccidus* var. *douglasii*?. Photo by Sharon Franklet?



DSCN8323.JPG; Dave Nelson? with *Eriogonum*. Photo by Sharon Franklet?



bacharus_salicifoliu_2_pinnacles_20070407.JPG; Baccharis salicifolius. Photo by Elizabeth Speith



bacharus_salicifolius_pinnacles_20070407.JPG; Baccharis salicifolius. Photo by Elizabeth Speith



dendromecon_rigida_2_pinn_20070406.JPG; Dendromecon rigida. Photo by Elizabeth Speith



dendromecon_rigida_pinn_20070406.JPG; Dendromecon rigida. Photo by Elizabeth Speith



DSCN2405.JPG; Andrea Williams directs searchers. Photo by Elizabeth Speith



DSCN2406.JPG; Supersearcher Janet Cicero on the move. Photo by Elizabeth Speith



DSCN2407.JPG; The group ponders a licheny branch. Photo by Elizabeth Speith



DSCN2408.JPG; The group ponders a licheny branch. Photo by Elizabeth Speith



DSCN2409.JPG; Volunteer Jan Shriner ponders her next move. Photo by Elizabeth Speith



DSCN2410.JPG; The mysterious unknown (Rorippa curvisiliqua?). Photo by Elizabeth Speith



DSCN2411.JPG; Volunteer Brian Keelan looks up a plant. Photo by Elizabeth Speith



IMG_0428.JPG; Searcher Eileen Keelan, flags at the ready. Photo by Andrea Williams



IMG_0429.JPG; Volunteers pause for a hydration break. Photo by Andrea Williams



IMG_0430.JPG; Successful Easter egg-plant hunters Jan Shriner and Bruce Delgado. Photo by Andrea Williams



IMG_0431.JPG; Successful Easter egg-plant hunters Jan Shriner and Bruce Delgado. Photo by Andrea Williams



IMG_0432.JPG; What a weekend of raving will do to you: Elizabeth Speith, plant geek. Photo by Andrea Williams



uppermccabecanyon_pinn_20070406.JPG; Photo by Elizabeth Speith



IMG_0543.JPG; BISE20070726N 0 to 30m. Photo by Andrea Williams



IMG_0544.JPG; BISE20070726N 30 to 0m. Photo by Andrea Williams



IMG_0545.JPG; Scirpus microcarpus. Photo by Andrea Williams



IMG_0546.JPG; Big Seep from 15m of BISE20070726N looking NNW. Photo by Andrea Williams



IMG_0547.JPG; Big Seep from 15m of BISE20070726N looking NW. Photo by Andrea Williams



IMG_0548.JPG; Big Seep from 15m of BISE20070726N looking W. Photo by Andrea Williams



IMG_0549.JPG; Big Seep from 15m of BISE20070726N looking SW. Photo by Andrea Williams



IMG_0550.JPG; Big Seep from 15m of BISE20070726N looking S. Photo by Andrea Williams



IMG_0551.JPG; Big Seep from 15m of BISE20070726N looking SE. Photo by Andrea Williams



IMG_0552.JPG; Big Seep from 15m of BISE20070726N looking E. Photo by Andrea Williams



IMG_0553.JPG; Big Seep from 15m of BISE20070726N looking NE. Photo by Andrea Williams



IMG_0554.JPG; Big Seep from 15m of BISE20070726N looking N. Photo by Andrea Williams



IMG_0555.JPG; Seep 2, Little Seep, from center looking N. Photo by Andrea Williams



IMG_0556.JPG; Seep 2, Little Seep, from center looking NE. Photo by Andrea Williams



IMG_0557.JPG; Seep 2, Little Seep, from center looking E. Photo by Andrea Williams



IMG_0558.JPG; Seep 2, Little Seep, from center looking SE. Photo by Andrea Williams



IMG_0559.JPG; Seep 2, Little Seep, from center looking S. Photo by Andrea Williams



IMG_0560.JPG; Seep 2, Little Seep, from center looking SW. Photo by Andrea Williams



IMG_0561.JPG; Seep 2, Little Seep, from center looking W. Photo by Andrea Williams



IMG_0562.JPG; Seep 2, Little Seep, from center looking NW. Photo by Andrea Williams



IMG_0563.JPG; SURVEYANWIYSTB20070406A04 0 to 30m. Photo by Andrea Williams



IMG_0564.JPG; Tarantula hawk (Pepsis thisbe?) on narrow-leaved milkweed (Asclepias fascicularis). Photo by Andrea Williams



IMG_0565.JPG; Tarantula hawk (Pepsis thisbe?) on narrow-leaved milkweed (Asclepias fascicularis). Photo by Andrea Williams



IMG_0566.JPG; Glycyrrhiza lepidota. Photo by Andrea Williams



IMG_0567.JPG; Glycyrrhiza lepidota. Photo by Andrea Williams



IMG_0568.JPG; Stachys albens?. Photo by Andrea Williams



IMG_0569.JPG; Aster chilensis. Photo by Andrea Williams



IMG_0570.JPG; Aster chilensis. Photo by Andrea Williams

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS D-91, January 2008

National Park Service
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